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Examiners' Report January 2011

GCE Biology 1 6BI01 01

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Introduction

The questions on this paper yielded a wide range of responses and some very good answers were seen; this resulted in a good spread of marks. The majority of the specification covered has been covered in previous series, albeit in different styles of question. There were some very straightforward questions that yielded high marks across the ability range and some more challenging questions that discriminated well. What was evident was that certain specification topic areas that have yielded high marks in the past, did not this time when the emphasis of the question was shifted slightly; this was particularly evident in question 8b. It was also very clear that candidates do not read the question carefully enough and as a result drop very straightforward marks.

Question 1(b)(i)

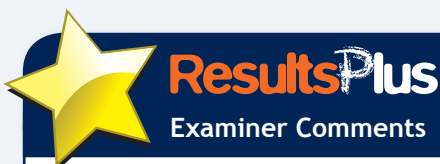
The multiple choice questions at the beginning of question one were extremely well answered with many candidates scoring the full 5 marks. Part b was more variable, mostly depending on whether or not the command word *describe* in part (i) had been correctly identified.

This item is a good illustration of how a failure to identify command words can result in very straightforward marks being lost.

- (i) Using the information in the graph, describe what the results of this trial show.

(2)

The results of this trial show that the treatment group has a lower amount of plaque than the control group. As the mean change in volume is -60 mm^3 for the treatment group and for the control group it is $+10\text{ mm}^3$, showing a higher amount of plaque.



This question asks for a description of the results of this trial. There are two sets of results shown; the control group results and the treatment group results. Therefore there should be two separate descriptions. In this response the candidate has compared the results and as a result not actually told us what happens to the plaque size in either group.

In addition, the candidate should not assume that a reference to '-' or '+' means a 'decrease' or 'increase' respectively.



Do not use short hand, symbols or text speak in your answers - the examiner will not make assumptions as to your meaning of these abbreviations. Always write your words out in full, unless using an accepted abbreviation such as DNA or ATP.

Question 2(b)(ii)

In question 2b candidates tended to lose marks through lack of specificity or poor wording. The precise location of the structures were not given and a number of candidates suggested that the elastic fibres contracted, failing to realise that their properties and role are distinct from the muscle cells.

Elastic fibres

throughout length

Location of aorta

Function contained in 2 layer of muscle around endothelium.

Diagram labels: lumen, endothelium, artery wall, muscle & elastic fibres.

(3)

Allows aorta to stretch & recoil - so helps transport blood around the body by ~~then~~ artery recoiling behind the blood pushing it round the body.


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Examiner Comments

It is very rare that candidates score marks from diagrams, as they do not label them fully. This is a good example where a diagram is credit worthy, as it is clearly labelled showing the positioning of the elastic fibres. The description of the function scored two marks.


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Examiner Tip

Examiners will mark what you have written and not interpret your unlabelled diagrams. If you want to use diagrams to answer a question then they must be fully labelled. It is often quicker and more effective to write a written description.

Question 4(b)

This question illustrated how candidates do not read the question carefully enough. The question asks them to show the direction of flow of blood on the *right* side of the heart. Many candidates either showed both sides or the left side only, despite the fact that we even labelled each side of the heart for them.

Question 4(c)

(c) Explain why a mammalian heart is divided into a right side and a left side.

(2)

A mammalian heart is divided into a right side and a left side to it can pump blood around the body and to the lungs quickly and efficiently. It acts as a double circulatory system. Blood travels around the body faster as a result.



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Examiner Comments

This is another example of candidates either not reading the question properly or not thinking about what is being asked. Many responses like this one were seen. Candidates were not being asked to *describe* the flow of blood or the arrangement of the heart but **WHY** the heart was divided into two halves.



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Examiner Tip

Identify the command words in the question - do not pick out key words and assume what is being asked.

Question 5(a)

Candidates need to identify which parts of the specification are being tested in a question of this style and not write detailed accounts of Biology that are not part of the specification. Candidates are expected to know about the affect that mutations have on the structure of DNA and the subsequent structure of a protein, not about sickle cell anaemia or iron deficiency.

5 Thalassaemia is the name of a group of inherited blood disorders that affect the body's ability to produce haemoglobin in red blood cells. Red blood cells are produced in bone marrow.

Oxygen in the lungs binds to haemoglobin and is carried to the cells of the body to be used in respiration.

Beta thalassaemia is the result of a mutation in the gene coding for the β chain of haemoglobin. If a person inherits gene mutations from both parents, this person will show symptoms of anaemia and will require blood transfusions. Symptoms of anaemia include tiredness and breathlessness.

*(a) Using the information given above and your knowledge of gene mutation, suggest why a person with beta thalassaemia has symptoms of anaemia.

(4)

A person with β Thalassaemia could have symptoms of anaemia because β Thalassaemia will reduce the levels of haemoglobin in red blood cells which in turn would result in tiredness and breathlessness (symptoms of anaemia) because there will be a lack of oxygen being carried in the circulatory system, due to oxygen not being efficiently digused to the red blood cells as a result of the lack of haemoglobin. Oxygen is required for cells to respire and is transported to the cells which require it with red blood cells, however a person with β Thalassaemia will have less ability to oxygenate cells causing tiredness and breathlessness (anaemic symptoms).



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Examiner Comments

Candidates frequently wrote vague statements that did not specifically describe individual reasons for tiredness and breathlessness (the symptoms of anaemia). This candidate scored marking points 5 and 6 but not 7 and 8. We frequently saw responses that explained the reasons for both tiredness and breathlessness in one sentence but did not state which factor caused which effect.



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Examiner Tip

Write very short snappy sentences that contain one piece of information only.

- 5 Thalassaemia is the name of a group of inherited blood disorders that affect the body's ability to produce haemoglobin in red blood cells. Red blood cells are produced in bone marrow.

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- *(a) Using the information given above and your knowledge of gene mutation, suggest why a person with beta thalassaemia has symptoms of anaemia.

(4)

a person with beta thalassaemia has symptoms of anaemia because their body produces insufficient haemoglobin, this means that less oxygen can bind to the haemoglobin in the blood to be transported around the body for respiration. This reduced rate in respiration could result in a lack of energy being produced so could then cause tiredness. breathlessness would be as a result of the body trying to gain sufficient oxygen.



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Examiner Comments

An exemplary answer. Mark point 4 on the 3rd line, mark point 5 on the 5th, mark point 6 on the 6th, mark point 8 on the 8th and mark point 7 on the last line, max 4.

Question 5(c)

This is a very good example where a standard mark scheme for a particular specification point needs to be learnt and applied to a question.

With respect to gene therapy, we expect the candidates to know that the normal allele is incorporated into an appropriate vector such as a virus which is used to introduce the DNA into the cell and that this needs to be repeated. This will be the framework of our mark scheme in questions of this type.

(c) Gene therapy could potentially be used to treat beta thalassaemia.

Suggest how gene therapy could be carried out to treat this disorder.

(4)

A virus could be used as a vector, ~~with~~ if it has been genetically modified so it will not replicate and contains the healthy gene for the β chain of haemoglobin. It would be placed inside the body by nasal spray or otherwise. The virus containing the gene would then travel into a cell by endocytosis, and the gene would travel into the nucleus and attach to the DNA strands already present. The cell would then produce functioning haemoglobin, but the nasal spray would need to be taken again after a week or so as the cells affected previously may have died. Alternatively, a lipoprotein could be used as a vector.



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Examiners' Comments

This was a very good response that scored 4 max. Mark points 6,5,1,2,3 and 8, in that order in the account.



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Examiner Tip

Use past paper mark schemes to learn what are the salient mark points for each specification point and then write these in your answer, in the context of the question.

(c) Gene therapy could potentially be used to treat beta thalassaemia.

Suggest how gene therapy could be carried out to treat this disorder.

(4)

Using a vector a 'correct' or 'normal' gene could be carried into the bone marrow where red blood cells are created. This 'normal' gene would then potentially replace the mutated gene which affects the body's ability to produce haemoglobin. With the 'normal' gene it will be fully functionally able to create haemoglobin which will make the anaemia ^{symptoms} less severe. However gene ~~therapy~~ ^{therapy} is not totally efficient and is only temporary therefore it would have to be repeated.



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Examiner Comments

A common miss-conception associated with gene therapy is that the defective allele is somehow removed and therefore replaced by the normal allele. This response was very typical.



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Examiner Tip

In gene therapy, the defective alleles are not replaced. The functioning allele is inserted to take over the production of the normal protein.

Always read through your answers carefully to ensure that you have used plain English that means exactly what you want it to mean.

Question 6(a)

It was wonderful to see a question on a core practical that had clearly been done in centres and learnt by candidates.

6 The size and solubility of molecules has an effect on their ability to be taken up by cells.

*(a) Describe an experiment you have carried out to investigate the permeability of cell membranes.

(5)

The experiment I carried out was to observe the permeability of beetroot cell membranes at different temperatures. The ~~temp~~ temperatures were : 0°C, 20°C, 40°C, 60°C. ~~8~~ ~~8~~ ~~8~~
~~em~~ Eight 1 cm³ cubes of bet beetroot were cut and each placed in a testtube with 10ml of water in it. There was two testtubes for each temperature. The testtubes were left in water basin's which had the water of the before mentioned temperatures in them. They were left for half an hour. After the time each test ~~tube~~ tube was taken out and the permeability was measured ~~was~~ using colorimeter. Beetroot has a red pigment within its cells so we used this knowledge to test how ~~transparent~~ ^{much} the water solutions ^{from the test tubes absorbed the light} ~~was~~ with the given temperatures the test. An average result was taken between ~~tes~~ the two test tubes that had been in the same water basin. The more light absorbed meant the more permeable the membrane was



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Examiner Comments

This is an example of a typical answer seen. This response scored mark points 1,5,8,7 and 6, in that order in the response.



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Examiner Tip

Learn the fine details of the core practical thoroughly.

6 The size and solubility of molecules has an effect on their ability to be taken up by cells.

*(a) Describe an experiment you have carried out to investigate the permeability of cell membranes.

(5)

- Firstly, I cut up five equal pieces of beetroot and used them to remove any pigment released ^{during} slicing.
- Then I prepared five different tubes all containing equal five 5cm³ volume of water.
- I then added each beetroot to a different test tube all with the same volume of distilled water.
- ~~For each~~ After that I placed each test tube into a different water bath with different temperatures of +10°C, 0°C, 10°C, 20°C, 30°C.
- After a while I removed the ~~test tubes~~ test tubes from the water baths and also removed the beetroot.
- The ~~pigment water~~ five different test tubes containing different pigments were then put on a colorimeter. The colorimeter measured the absorbance of light. I found that with increasing temperature more pigment was absorbed. Therefore increasing the temperature increased the permeability of the membrane.



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Examiner Comments

Although we expect candidates to demonstrate that a minimum of 5 values of the independent variable should be tested, we do expect the values to be realistic.

-10 would not work! A common error was to write calorimeter (line 17).

This response was still awarded 5 marks.



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Examiner Tip

Always try to write more points than there are allocated marks. This candidate made two mistakes that meant that they could not be awarded the two marks, but because they had written seven relevant points they still scored the full marks allocated to this question.

Question 6(b)(iii)

This question was slightly unusual but was a good illustration of how candidates should identify the theme of the question and think about what they have been taught. The stem of question 6 tells the candidate that the question is about transport of molecules across a membrane. The stem to part b indicates that they should be thinking about water specifically and its polar nature. They are supposed to know that membranes are hydrophobic in nature and that water is a polar molecule (which we even told them) and they are supposed to know water is a small molecule and passes through membranes by osmosis.

Question 7(a)(ii)

Question 7a(i) and ii are examples of where candidates have to observe visuals carefully and then state the obvious, clearly.

(ii) Give **one** difference between the structure of omega 3 and the structure of omega 6.

(1)

Omega 3 contain 3 ~~to~~ double bonds whereas
Omega 6 only has 2.



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Examiner Comments

This was a typical answer for part (ii), with comparable mistakes made in part (i). This question is a good illustration of how important precise, accurate wording is essential in even the most straightforward of answers. There are 3 *carbon-carbon* bonds in omega 3, but 4 double bonds in total.



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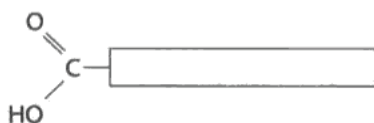
Examiner Tip

Think very carefully about what you are writing and always use time at the end of the exam to read through your answers to make sure you have said exactly what you mean.

Question 7(a)(iii)

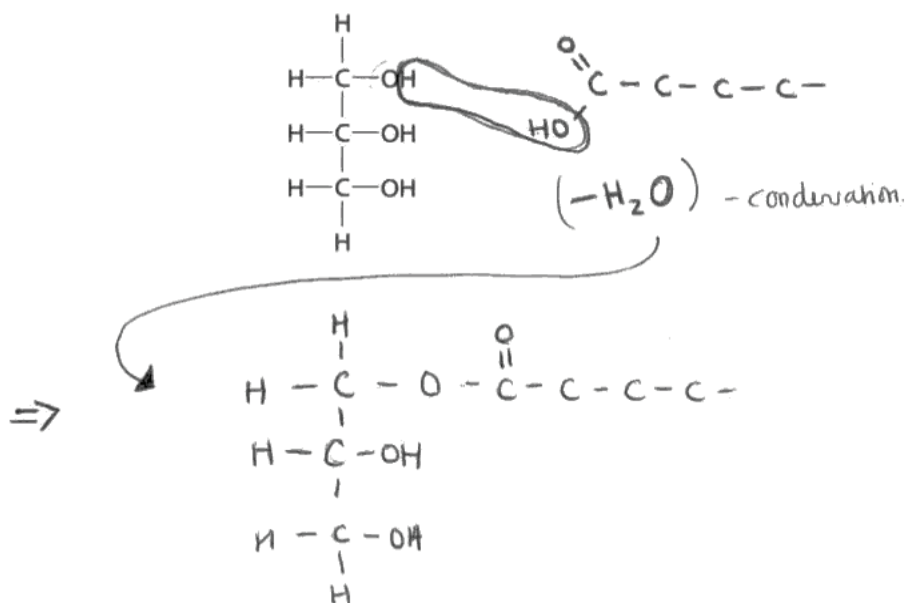
This question is an example of another way that we can examine candidates understanding of condensation reactions.

(iii) The diagram below shows a more simplified structure of omega 3.



A glycerol molecule is drawn below. Use these diagrams to show how one omega 3 molecule bonds to the glycerol molecule, by means of a condensation reaction, during the synthesis of a triglyceride.

(3)

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Examiner Comments

This response was exemplary and scored all three marks. However there were candidates that circled the H and OH without stating that water was formed, either by writing the word *water* or the correct formula.

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Examiner Tip

Do not leave any response to the interpretation of the examiner. You must write exactly what is required of you. In this example, just because you circle the H and the OH, the examiner will not make the assumption that this means you know water is formed - tell {him / her} !

Question 7(b)

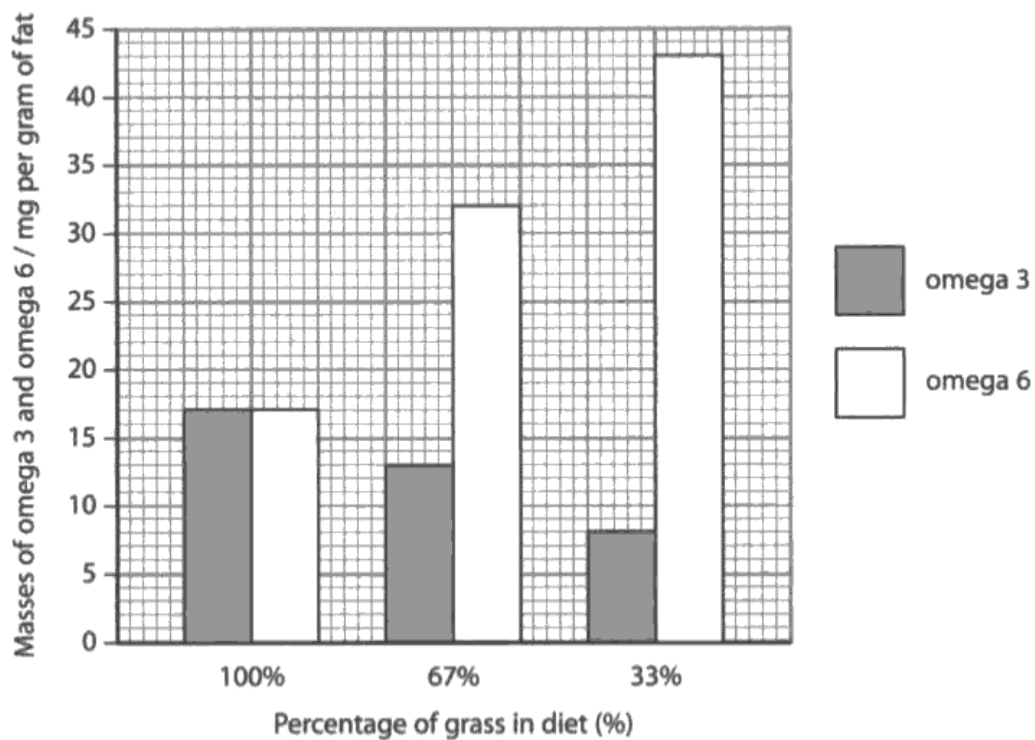
A good example of where candidates need to identify commands correctly and know how to correctly answer such questions.

(b) Omega 3 and omega 6 are both present in animal fats.

The proportion of omega 3 and omega 6 in animal fat has been shown to depend on the diet of the animals.

In an investigation, the masses of omega 3 and omega 6, per gram of fat, were determined in the fat from cows fed on a diet containing 100%, 67% or 33% grass.

The results of this investigation are shown in the graph below.



Cows fed a diet of 100% grass have an equal amount of omega 3 and 6. Cows fed a diet of 67% grass have a low amount of omega 3 and high amounts of omega 6. Cows with 33% of their diet being grass have a high proportion of omega 6 than a low amount of omega 3.

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Examiner Comments

Candidates are still writing answers that put the data into words and do not describe the main trends that the data shows. There are still a significant number of candidates that quote figures from the graphs without manipulating them. This candidate has not picked out the overall effects that the quantity of grass has on the percentage of omega 3 and 6.

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Examiner Tip

In *describe* questions, always start by stating the overall change in the dependant variable and then calculate this difference. After that, comment on significant changes, although this is not actually appropriate in this question.

Question 7(c)(i)

Candidates really need to read the question carefully and not pick out key words to make assumptions as to what is being asked. Candidates also need to think very carefully about the extent to which their response answers the question asked. Very straightforward marks were lost by a high proportion of candidates in this question.

(i) High blood pressure is another factor that increases the risk of CVD.

Give **two** other dietary factors that increase the risk of CVD.

(1)

1 not doing enough exercise

2 having a fatty diet

(ii) Omega 3 has been shown to lower blood pressure. Antihypertensives can



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Examiner Comments

A frighteningly high number of candidates gave non-diet related answers to this question, as illustrated here.



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Examiner Tip

READ THE QUESTION !

(i) High blood pressure is another factor that increases the risk of CVD.

Give **two** other dietary factors that increase the risk of CVD.

(1)

- 1 High levels of salt
- 2 Consuming ~~unsaturated~~ saturated fats.

(ii) Omega 3 has been shown to lower blood pressure. Antihypertensives can



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Examiner Comments

Poorly worded answers, as illustrated here, lost easy marks.



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Examiner Tip

You need to be precise in your answers. Fatty acids as such do not *increase* the risk - *high* saturated fats do however.

Look at as many past paper mark schemes as are available, to find out exactly the wording you are supposed to use in your answers. You have to write almost exactly what is printed in them.

Question 8(a)(ii)

This particular question addressed one of the few remaining specification points that we have not directly addressed yet. The mark scheme indicates exactly what we are expecting candidates to appreciate about the primary structure and its influence on the structure and therefore the functioning of a protein.

- (ii) Using the diagram and your own knowledge of enzymes, explain the importance of the primary structure of an enzyme to its function.

(5)

The sequence of amino acids will determine which R groups appear in certain places. This then will cause the protein to coil and fold up forming specific bonds e.g. Hydrogen or disulphide bridges in certain places due to the R groups. This causes a specific shape which is important for enzymes as their active site will only suit a specific molecule if it doesn't fit the enzyme is useless so the primary structure (sequence of amino acids) is important in causing this correct shape for the enzymes job.



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Examiner Comments

This illustrates a particularly good answer. This candidate was awarded mark points 1.2.3.5 and 6, in that order.



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Examiner Tip

When referring to the structure and functioning of an enzyme, always write about the *shape* of the active site.

Question 8(b)(i)

Question 8(b) parts (i) and (ii) seemed to throw candidates completely, even though we have often asked questions about transcription and translation. Candidates were not being asked to recall anything extra, but to apply their answer such that the context answered the question.

(b) Describe the roles of messenger RNA (mRNA) and transfer RNA (tRNA) in protein synthesis.

(i) Messenger RNA

(3)

mRNA attaches to the antisense strand of DNA, and with base pairing, creates a template of a DNA strand. However, Thymine is replaced with Uracil. This all happens in the nucleus. The mRNA then leaves the nucleus through pores to the cytoplasm and attaches to the ribosome.

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Examiner Comments

This candidate described the process of transcription and did not emphasise the role of mRNA.

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Examiner Tip

Try to apply your knowledge to the question; do not simply write everything you know about a topic.

Question 8(b)(ii)

(ii) Transfer RNA

(3)

The tRNA is made in the ribosomes. It is involved in translation. It is attached to a specific amino acid. It has ~~two~~ three anti-codons on them which code for the amino acid at the other end. The ~~anti~~ anti-codons pair up with the codons during translation to form a sequence of amino acids joined together by peptide bonds.

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Examiner Comments

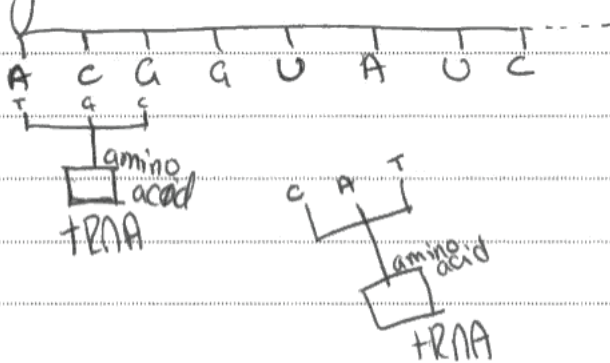
A good, clear answer.

(ii) Transfer RNA

(3)

translation

tRNA, using mRNA, completes the ~~protein~~ chain, using amino acids.

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Examiner Comments

This illustrates our bottom line for accepting marks from a diagram. We did award mark point 2, although it would have been clearer if the candidate has bracketed the top part as the tRNA.

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Examiner Tip

Be very cautious about trying to answer questions using diagrams, unless being specifically asked to. If you do, then make your labels very clear and accurate.

(ii) Transfer RNA

(3)

tRNA is what is used to make up polypeptides, and in turn proteins. ~~to tRNA joins onto amino acids~~ amino acids join onto the tRNA, for specific sequencing to make specific poly peptides

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Examiner Comments

Unfortunately, although the candidate has the jist of translation, the expression is not clear enough to award any marks. The answer clearly states that more than one amino acid is attached to a tRNA molecule which is simply untrue. Mark point 2 cannot be awarded for wrong Biology.

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Examiner Tip

Read though every single word of your answer to check that you have actually said what you mean.

This is a particularly good paper to use in giving candidates exam technique practice. Candidates need to learn the difference between the command words *explain*, *describe* and *compare*. They also need to read the question carefully, to ensure that they have identified the correct command word and not made any assumptions because of the context of the question or the style of the data presentation. Candidates also need to identify which part of the specification they are being tested on in any one question, to help guide them into what to write in their answer.

When referring to the structure and functioning of an enzyme, always write about the *shape* of the active site.

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